

**Seasonal Abundance and Distribution of Adult Stoneflies
of Sashin Creek, Baranof Island, Southeastern Alaska**
(Plecoptera)

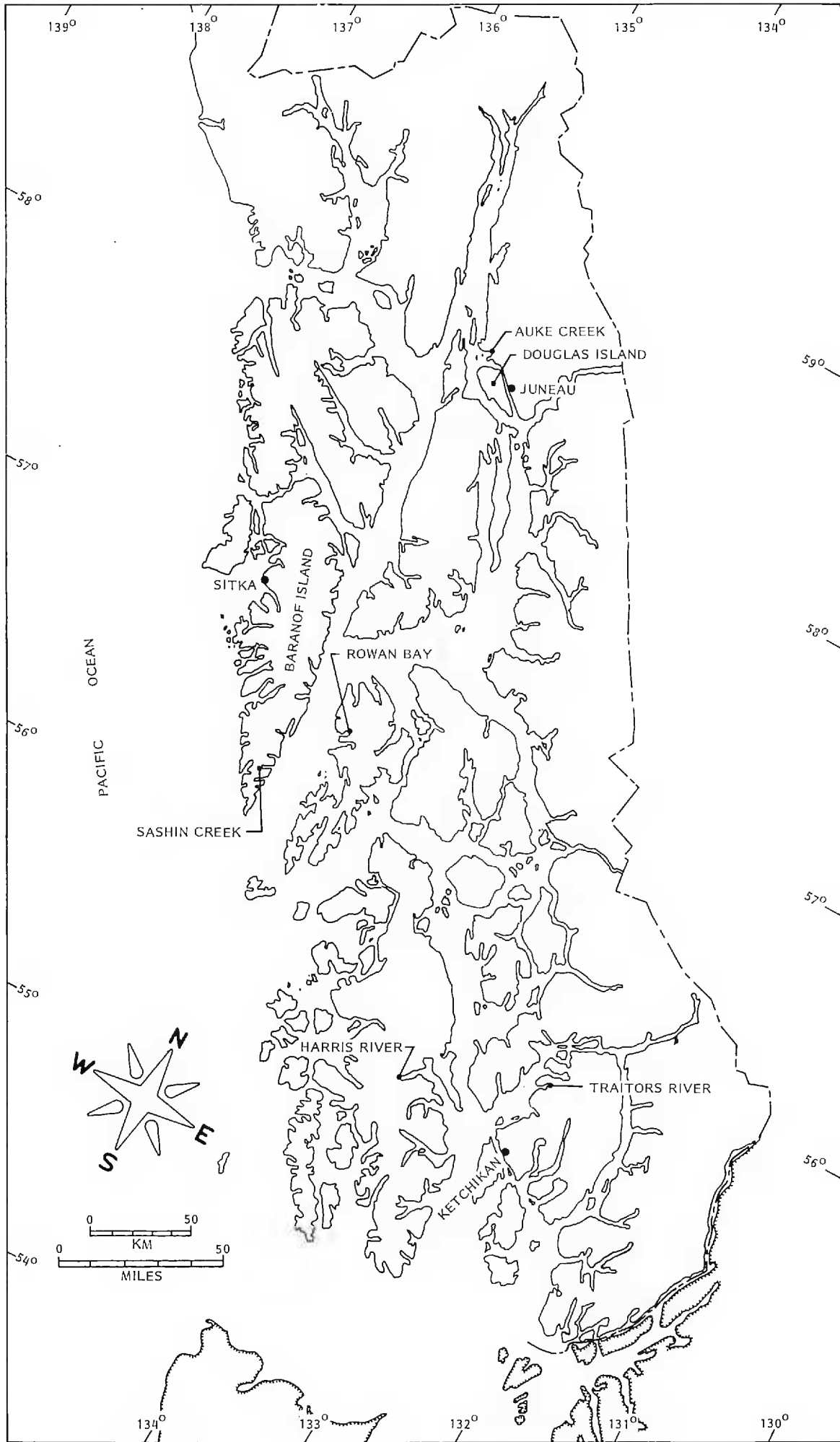
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In this paper I record the species of stoneflies in the study area and describe the relative abundance and seasonal and spatial distributions of the adults. In addition I record some incidental observations on the biology of some species. The collections were made intermittently from 1965 to 1972.

Sashin Creek is located at approximately lat $56^{\circ}23'N$, long $134^{\circ}44'W$, on the southeast shore of Baranof Island, southeastern Alaska (Fig. 1). Sashin Creek originates about 4,000 m from the ocean in a lake 56 ha in area nested between mountains at 83 m elevation and also receives waters from several smaller lakes and ponds. Precipitation averages about 560 cm per year at sea level near the mouth of Sashin Creek. Snow usually covers the ground from late October to April—usually to depths exceeding 1 m after November. The annual range in volume of flow of Sashin Creek is about 0.2 to 20 m³/s. This study was concentrated in that portion of the stream between its mouth at tidewater and a 30-m falls about 1,200 m upstream. The gradient of the stream increases from about 0.1% near tidewater to about 0.7% close to the falls where the elevation is about 5 m above sea level. The size of the stream bottom gravel increases similarly—from about 47% cobbles near tidewater to 81% close to the falls. The stream runs through a forest of western hemlock (*Tsuga heterophylla* [Raf.] Sarg.) and Sitka spruce (*Picea sitchensis* [Bong.] Carr.) and has relatively stable banks with overhanging brush, mostly alder (*Alnus*). Also present are salmonberry (*Rubus spectabilis* Pursh.), blueberries (*Vaccinium*), and devilsclub (*Oplopanax horridus* [Sm.] Miq.). The stream bottom along the shores frequently contains branches and logs in various stages of decomposition.

The resident fish of Sashin Creek in approximate order of abundance are juveniles of coho salmon (*Oncorhynchus kisutch* (Walbaum)) and rainbow trout (*Salmo gairdneri* Richardson) and both juveniles and adults of Dolly Varden (*Salvelinus malma* (Walbaum)) and coastrange sculpin (*Cottus aleuticus* Gilbert). Many pink salmon (*O. gorbuscha*



(Walbaum)), and fewer chum salmon (*O. keta* (Walbaum)) spawn in the stream, but their progeny go to the ocean soon after they emerge from the gravel in April, May, or June.

MATERIALS AND METHODS

I made 204 collections of adult stoneflies intermittently as part of larger programs. Stoneflies were collected by air-net sweeping and beating of streamside brush, hand-picking with forceps, and by rearing nymphs. Specimens were killed and stored in 70% alcohol. A reference collection of adult stoneflies is maintained at the Auke Bay Fisheries Laboratory.

In the following list of adult stoneflies from Sashin Creek, each species occurred throughout the study area below the falls unless otherwise noted. Most of the collecting was done below the falls and special mention will be made if I collected the species also above the falls or in other streams in southeastern Alaska.

SEASONAL DISTRIBUTION AND ABUNDANCE

I made collections in Sashin Creek that could have yielded adult stoneflies on 75 days from the first week of March to the first week in October. Unusually low winter temperatures can cause delay in onset of emergence of stoneflies in temperate climates (Elliott, 1967; Harper and Pilon, 1970). Sashin Creek however, has a combination of relatively high latitude, marine situation, and several tributary lakes or ponds which greatly reduces within and between season variations in water flow and temperature. I have therefore assumed that timing and sequence of emergence of the species of stoneflies in Sashin Creek is essentially the same from year to year and combined collections from all years to compare seasonal occurrence and sequence of emergence of adult stoneflies. The distribution of sampling effort by week is summarized in Figure 2 along with periods of occurrence for each species. No collections were made between the first weeks of October and March, but incidental observations have never revealed adult stoneflies at this time in Sashin Creek.

The several species of stoneflies differed in abundance and length of period of occurrence and I define seven general categories from

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FIG. 1. Map showing location of streams and rivers mentioned in the text.

consideration of the collection data (Table 1 and Fig. 2). The categories and species involved are:

1. Very abundant for several weeks: *Suwallia pallidula*
2. Abundant for several weeks: *Capnia excavata*, *Sweltsa exquisita*, *Zapada cinctipes*
3. Common for several weeks: *Sweltsa borealis*, *Sweltsa oregonensis*
4. Very abundant for many days: *Capnia nana*
5. Common for many days: *Capnia melia*
6. Abundant for a few days: *Zapada frigida*
7. Rare for a few days: *Doddsia occidentalis*, *Megarcys signata*, *Despaxia augusta*, *Paraleuctra occidentalis*, *Paraleuctra sara*, *Podmosta decepta*, *Zapada oregonensis*, *Alloperla serrata*.

The seasonal progression of emergence and varying lengths of the periods of occurrence make it likely that four to six species of adult stoneflies could be collected from Sashin Creek on any day from mid-March to mid-September. Two of the common seasonal categories of species are evident in Figure 2 where "spring" (*Capnia*, *Zapada*) and "summer" (*Alloperla*, *Sweltsa*) groups appear.

Collection Data for Adult Stoneflies from Sashin Creek

The collection data are summarized in Table 1 and further details are presented along with the annotations for each species. Jewett (1959) brought together illustrations of characters for identification of all the males and most of the females of the Pacific Northwest which covers all species found in Sashin Creek. Jewett supplies references for illustrations of the other females that have been described. First records for Alaska are indicated in Table 1.

COLLECTION DATA

NEMOURIDAE.—Four species of Nemouridae were found but only *Zapada cinctipes* was abundant. For the entire collection *Z. cinctipes* was one of the five most common species in total numbers, number of collections, and number of days on which it occurred. The other three species of Nemouridae were among the six least common species (Table 1).

Podmosta decepta (Frison).—One of six least common stoneflies collected at Sashin Creek but found from lowest area to above falls and in Traitors River, Harris River, and "Middle Creek" (Rowan Bay).

Zapada cinctipes (Banks).—One of the most common stoneflies of Sashin Creek; occurred from early spring with earliest winter stone-

TABLE 1.—Number of specimens, collections, and collection days for each species of adult stonefly collected in Sashin Creek, 1965–72 (*indicates first record for Alaska).

Family and Species	Number of Specimens		Number of collections	Number of collection days
	Male	Female		
Nemouridae				
<i>Podmosta decepta</i> *	9	16	5	3
<i>Zapada cinctipes</i>	260	233	54	28
<i>Zapada frigida</i>	21	7	2	1
<i>Zapada oregonensis</i>	7	1	5	3
Leuctridae				
<i>Despaxia augusta</i>	23	3	14	9
<i>Paraleuctra occidentalis</i>	11	6	9	4
<i>Paraleuctra sara</i> *	3	3	4	3
Capniidae				
<i>Capnia excavata</i> *	445	169	68	29
<i>Capnia melia</i> *	58	21	26	12
<i>Capnia nana</i> *	855	1,221	59	13
Taeniopterygidae				
<i>Doddsia occidentalis</i>	1	0	1	1
Perlodidae				
<i>Megarcys signata</i> *	0	1	1	1
Chloroperlidae				
<i>Alloperla serrata</i>	1	0	1	1
<i>Suwallia pallidula</i>	1,007	800	68	34
<i>Sweltsa borealis</i>	17	28	23	18
<i>Sweltsa exquisita</i>	88	242	39	26
<i>Sweltsa oregonensis</i>	9	30	24	20

flies of genus *Capnia* to July. Although *Z. cinctipes* was found up to 15 m away from stream on snow, it did not seem to be actively migrating. *Z. cinctipes* was collected at Auke Creek and the lowest area to above the falls in Sashin Creek.

Zapada frigida (Claassen).—One of six least common stoneflies collected at Sashin Creek. It was found only above falls and although

found on only 1 day, was then abundant. Type locality for *Z. frigida* is across Baranof Island and somewhat north at Sitka, Alaska.

Zapada oregonensis (Claassen).—Although one of six least common stoneflies collected at Sashin Creek, this species was found both above and below falls.

LEUCTRIDAE.—Adult Leuctridae occurred only rarely—the three species captured were among the six least commonly captured species and were never abundant.

Despaxia augusta (Banks).—A late summer-early fall form and the most abundant of the Leuctridae. The other two species, *Paraleuctra occidentalis* and *P. sara*, are early summer forms. *D. augusta* was found both above and below falls.

Paraleuctra occidentalis (Banks).—An early summer form found in all areas below falls.

Paraleuctra sara (Claassen).—An early summer form, collected both above and below falls and in Traitors and Harris rivers.

CAPNIIDAE.—The three species of Capniidae from Sashin Creek are winter forms and begin their emergence while the ground is deeply covered by snow. Two of the three are among the five most abundant species. *Capnia melia* and *C. nana* appeared to actively migrate by walking over the snow away from the stream and into the forest. I observed hundreds of individuals, all moving at nearly 90° to the stream across the snow. A few were found on a steep hillside among mature spruce and hemlock trees 150 m away from Sashin Creek. The fate of these migrants is unknown.

Capnia excavata Claassen.—One of most abundant and commonly present stoneflies of Sashin Creek, although the long period of occurrence may be due to a long-lived adult. One female was collected above falls. *C. excavata* was also collected at Traitors River.

Capnia melia Frison.—Least abundant of the *Capnia* in Sashin Creek and not collected above falls. *C. melia* was part of cross-snow migration at Sashin Creek and was also collected on snow near an unnamed stream on Douglas Island at about 200-m elevation.

Capnia nana Claassen.—Second most abundant of the stoneflies from Sashin Creek and the major species in migration across snow both above and below falls. *C. nana* occurs abundantly with *C. excavata*, *C. melia*, and *Zapada cinctipes* on snowbanks in early spring.

TAENIOPTERYGIDAE.—A single species, *Doddsia occidentalis* (Banks). Only one specimen collected, but collection site, weather, and snow conditions at the time make it likely that this specimen originated in Sashin Creek.

COLLECTION PERIOD AND SPECIES	MARCH				APRIL				MAY				JUNE				JULY				AUG.				SEPT.				OCT.			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
COLLECTION PERIODS	—————																															
<u>ZAPADA CINCTIPES</u>	—————																															
<u>CAPNIA EXCAVATA</u>	—————																															
<u>CAPNIA MELIA</u>	—————																															
<u>CAPNIA NANA</u>	—————																															
<u>DODDSIA OCCIDENTALIS</u>	—————																															
<u>PODMOSTA DECEPTA</u>	—————																															
<u>PARALEUCTRA OCCIDENTALIS</u>	—————																															
<u>SWELTSIA BOREALIS</u>	—————																															
<u>ZAPADA OREGONENSIS</u>	—————																															
<u>SWELTSIA EXQUISITA</u>	—————																															
<u>PARALEUCTRA SARA</u>	—————																															
<u>ZAPADA FRIGIDA</u>	—————																															
<u>SWELTSIA OREGONENSIS</u>	—————																															
<u>SUWALLIA PALLIDULA</u>	—————																															
<u>MEGARCYS SIGNATA</u>	—————																															
<u>ALLOPERLA SERRATA</u>	—————																															
<u>DESPAXIA AUGUSTA</u>	—————																															

FIG. 2. Periods when collections of stoneflies were made in Sashin Creek, 1965-72 (top line), and periods of occurrence of adults of each species.

PERLODIDAE.—A single species, *Megarcys signata* (Hagen). Only one adult was collected from Sashin Creek, but several *Megarcys* nymphs were found. All collections of nymphs and the adult are from above falls.

CHLOROPERLIDAE.—Chloroperlid nymphs are a significant part of the intergravel fauna of salmon spawning beds in southeastern Alaska (Nicola, 1968; Ellis, 1970) and are also common on logs in Sashin Creek. Nearly half the adult stoneflies of this study were chloroperlids.

Alloperla serrata Needham and Claassen.—Only one specimen was collected and that from above the falls. The same collection contained several *Sweltsa borealis*, *S. exquisita*, and *Suwallia pallidula*.

Suwallia pallidula (Banks).—This bright yellow stonefly was the most abundant species of this study (closely followed by *Capnia nana*) and by far the most abundant chloroperlid. *S. pallidula* collected both above and below falls, often abundantly—several collections contained more than 100 specimens. *S. pallidula* often seen on fruit of both red and yellow salmonberry along stream.

Sweltsa borealis (Banks) and *S. exquisita* (Frison)—Collected both above and below falls in Sashin Creek.

Sweltsa oregonensis (Frison).—Common during summer but never abundant. *S. oregonensis* found both above and below falls in Sashin Creek and at Traitors and Harris rivers and Auke Creek.

ACKNOWLEDGMENTS

Stanley G. Jewett, Jr., supplied encouragement and identified or confirmed the identifications of representatives of all species found in this study.

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SCIENTIFIC NOTE

***Trichophaga tapetzella* Linnaeus in the Galapagos Islands (Lepidoptera: Tineidae).**¹—Early in 1973 Dr. Pierce Brodkorb (Department of Zoology, University of Florida) found exuviae of a lepidopterous larva on the skin of a dead Galapagos flightless cormorant, *Nannopterum harrisi* (Rothschild), at Punta Espinosa, Fernandina Island. On March 23, 1973 an adult carpet moth, *Trichophaga tapetzella* Linnaeus, emerged. The specimen is deposited in the Florida State Collection of Arthropods, Division of Plant Industry, Gainesville.

Although cosmopolitan, *Trichophaga tapetzella* has not previously been recorded from the Galapagos Islands (Linsley and Usinger, 1966, *Proc. Calif. Acad. Sci.* 33(7): 113-196). The moth was reared in 1966 at Barrington Island (DeVries—*Calif. Acad. Sci.*) but this was not reported. Host preferences of the carpet moth when not an economic pest include general detritus and various kinds of animal matter.

Dr. Donald R. Davis (Department of Entomology, U.S. National Museum of Natural History, Washington, D.C.) kindly confirmed my determination of the adult moth from Fernandina Island and also told of captures of moths reared from owl pellets on the Galapagos Islands as related in correspondence to him, which could also be *Trichophaga tapetzella*.

Probably an accidental introduction by man, *Trichophaga tapetzella* may be firmly established in the Galapagos Islands by indication of the three reports of its occurrence there since 1966 noted herein.— J. B. HEPPNER, *Department of Entomology and Nematology, University of Florida, Gainesville, Florida 32611.*

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